BIOLOGICAL EVALUATION
Western Spruce Budworm Infestation on
The Bridger, Teton, Targhee & Caribou
National Forests
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INTRODUCTION

Western spruce budworm populations continue to infest Douglas-fir and true fir stands in portions of the Bridger, Teton, Targhee and Caribou National Forests, Wyoming and Idaho. The present infestation was first discovered in 1965 in portions of the Snake and Greys River drainages on the Bridger National Forest. Since then, the outbreak increased in size, reached a high of more than 130,000 acres in 1968, then began a steady decline until 1972. As predicted in 1971, the infestation increased slightly over the previous year. A year-by-year breakdown of defoliation by area and intensity for the four forest areas during the past 8 consecutive years follows:

Year	Forests[2]	Defoliation Intensity[1]			
		Light (Acres)	Medium (Acres)	Heavy (Acres)	Total (Acres)
1965	B	10,000	-	-	10,000
1966	B	33,000	800	-	33,800
1967	B, Ta	25,800	34,400	1,600	61,800
1968	B, Te, Ta, C	51,600	68,800	12,400	132,800
1969	B, Te, Ta, C	79,900	3,200	-	83,100
1970	B, Te, Ta, C	70,700	10,200	-	80,900
1971	B, Te, Ta, C	13,600	16,600	10,300	40,500
1972	B, Te, Ta, C	35,500	29,100	2,000	66,600

1/ Determined by aerial reconnaissance.
2/ B, Bridger; Te, Teton; Ta, Targhee; C, Caribou.

A further breakdown of defoliated area and intensity of feeding damage by Forest for 1972 is as follows:

Forest	Defoliation Intensity - 1972			
	Light (Acres)	Medium (Acres)	Heavy (Acres)	Total (Acres)
Bridger	29,000	26,000	1,800	56,800
Teton	3,000	2,000	200	5,200
Targhee	2,500	1,100	-	3,600
Caribou	1,000	-	-	1,000
	35,500	29,100	2,000	66,600

GENERAL INFORMATION

INSECT: Western spruce budworm, Choristoneura occidentalis Free.

HOST TREES: Douglas-fir, Pseudotuga menziesii; subalpine fir, Abies lasiocarpa; and Engelmann spruce, Picea engelmanni.

LOCATION: Grand Canyon of the Snake River and tributaries, Bridger, Teton, Targhee, and Caribou National Forests, Wyoming and Idaho.

TYPE OF DAMAGE: Defoliation of Douglas-fir, subalpine fir, and to a lesser extent, Engelmann spruce.

EXTENT OF THE INFESTATION: The infestation is confined to the Snake River Canyon and its tributaries east of Palisades Reservoir.

FEATURES OF THE AREA: A major two-lane highway parallels the Grand Canyon of the Snake River and is a main route to Jackson Hole, Grand Teton National Park, and Yellowstone National Park. Defoliation is visible from the highway from mid-July through early winter. However, at this time, no adverse public reaction has been received.

BIOLOGICAL INFORMATION

A systematic, on-the-ground, egg mass evaluation survey was conducted in late August 1972. Eight collection points--six on the Bridger Forest and two on the Teton Forest--were established and collected from. A collection consists of 2-30" branches from mid-crown (opposite quadrants) of 5 co-dominant, full crown Douglas-firs. The branches were cut with specially designed pole pruners, then individually labeled, bagged, and brought to the laboratory in Ogden for examination. Each branch was then carefully searched by a trained examiner for newly deposited and hatched egg masses. The number of new egg masses indicates within a reasonable range the degree of defoliation that can be expected the following year--1973. The results of the evaluation survey and damage predictions for 1973 follow:

Forest	Plot Location	Egg Masses Per Plot		Predicted Defoliation in 1973	Trend
		1971 (No.)	1972 (No.)	(%)	
Bridger	Higby Cr.	93	23	41-55	Decreasing
	Porcupine	82	50	56-100	Decreasing
	Bull Hollow	45	6	26-40	Decreasing
	Roos Cr.	154	94	56-100	Decreasing
	Bailey	NS	7	26-40	-
	Squaw Cr.	81	22	41-55	Decreasing
Teton	Fall Cr.	83	35	41-55	Decreasing
	Deer Cr.	72	42	56-100	Decreasing

Efforts are underway to measure impact and the effects of budworm feeding on tree growth in this and other infestations in the Region. In a preliminary investigation as to the effects on growth, several trees were felled in areas having a history of defoliation, sectioned at intervals along the bole and crown, and the disc sections examined through a binocular microscope to determine that part of the bole which might best show the effects of defoliation. Increment loss was apparent at all crown levels in almost all cases; consequently, it was concluded that the lower section (d.b.h.) was a valid sampling position. In 1971, increment cores were removed from each of five Douglas-fir trees (same trees used for egg mass survey) in three areas--Higby, Squaw, and Porcupine. The cores were examined under a binocular microscope and increment widths measured through a micrometer scale. The increment widths for each year from each of the five trees were fed into a Wang 720C computer and graphed automatically by a coupled Wang 702P portable plotter. Increment widths were then averaged, replotted, and exhibited in Figure 1 in the Appendix.

DISCUSSION

Although the infestation has been in progress for 8 years and certain areas received several consecutive years of heavy defoliation, no widespread or significant damage is apparent. In some localized areas, such as Pine, Roos, and Squaw Creeks and Grizzly Basin, where several successive years of heavy defoliation has occurred, some top kill of the larger trees and mortality of the understory has occurred. However, most of these sapling size trees were already in a suppressed and weakened condition.

The most significant and extensive damage to the budworm infested stands is in the form of reduced growth. Figure 1 shows the average growth increment from five Douglas-fir trees from three different areas. Shown below the graph is the progression of annual precipitation from a nearby weather station for approximately the same period. There appears to be several characteristics that are worthy of mention:

1. All three growth curves follow essentially the same pattern. There is a rapid surge of growth until 1947, then a sharp decline until 1950, followed by a rapid increase in the Squaw and Higby areas until 1963. The Porcupine area declined, remained static for several years, then began to increase in 1961. All three areas reached a peak in 1963, dropped slightly in 1964, then peaked again in 1965. From that time on, all areas experienced a relatively steady decline in growth increment. 1965 was also the first year of noticeable budworm defoliation, and it is also assumed that some feeding occurred prior to 1965, during the buildup years. Past records, however fragmentary and poorly documented, have mentioned the budworm's presence in 1926 (old Wyoming National Forest), in 1935 (small area on Greys River Unit), and again in 1945 (near Alpine, Wyoming). This last record of activity may explain the decrease in growth from 1947 to 1950.

2. There does not appear to be any correlation between annual precipitation and growth. From 1940 to 1957, precipitation remained above average, then dropped below average for five consecutive years. This was also the period when most of the trees were putting forth their most rapid growth. This may indicate that even though the moisture regime was below average, it was still sufficient for tree growth and, at these levels, it could not be a limiting factor. Precipitation remained above normal in 1963 and 1964, declined slightly in 1965, sharply in 1966, then exceeded the norm in 1967.

3. There is a marked difference in growth response between the three areas. Squaw and Higby plots occupy good sites (canyon bottom, deep soil) while the Porcupine site is less favorable (sidehill, shallow soil, high elevation and west aspect).

RECOMMENDATIONS

There is a significant reduction in the number of new egg masses found in 1972 compared to 1971, and this portends a decrease in defoliation in 1973. Hopefully, this decline will continue for more than just one year and permit those trees under stress to make a recovery. Control is not recommended.

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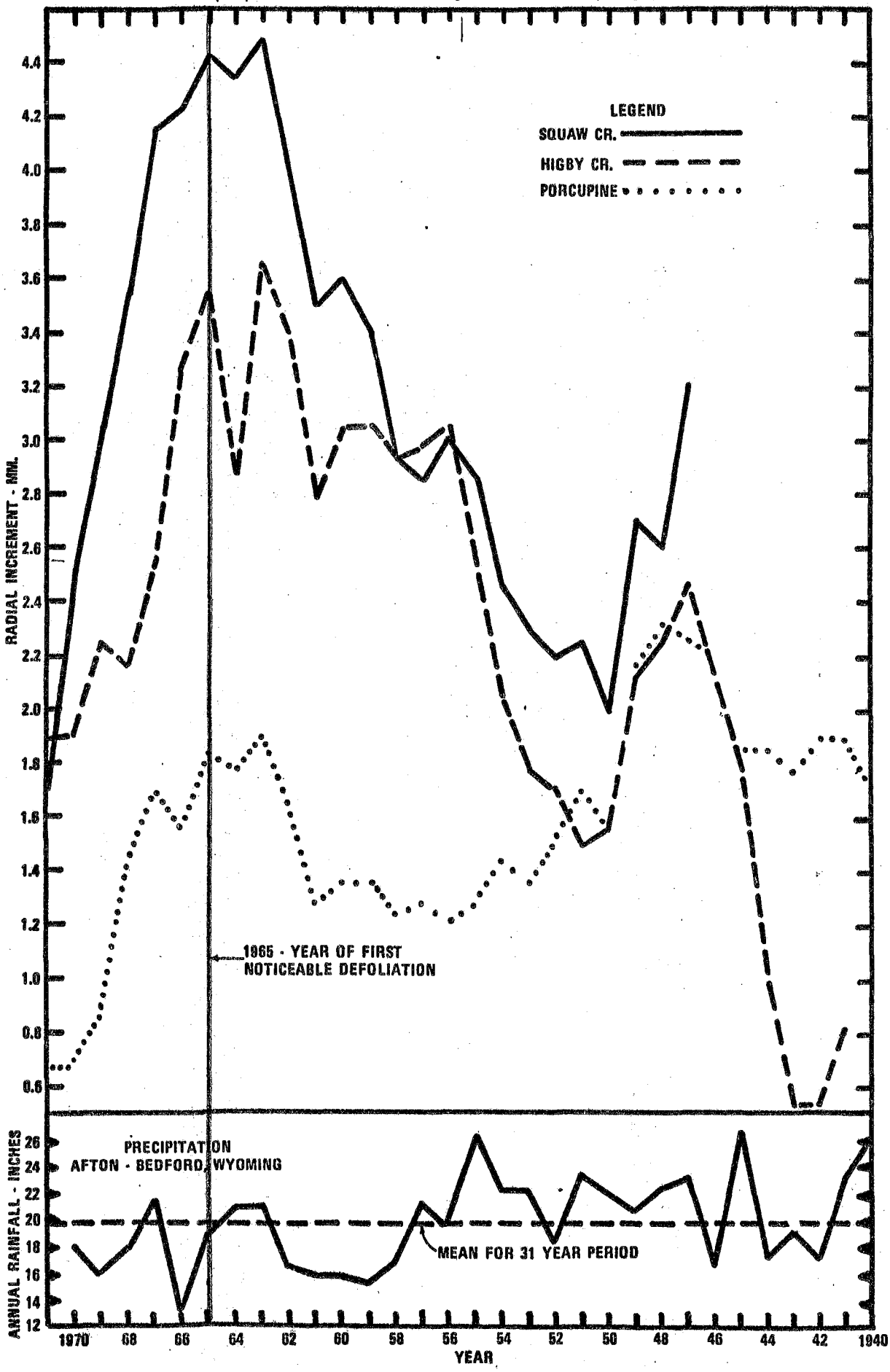
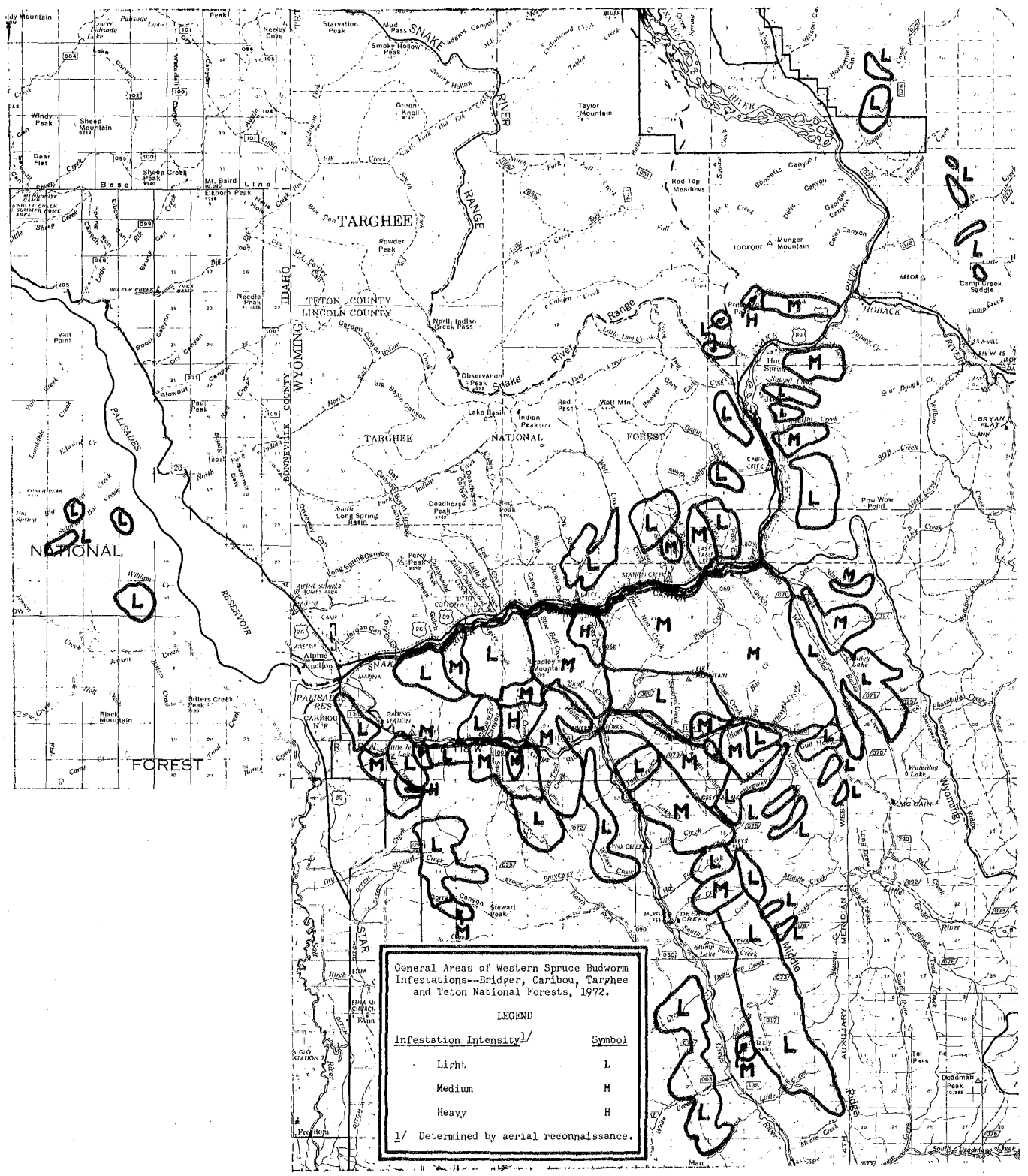
Figure 1. Record of Average annual increment from five Douglas-fir trees in three areas and annual precipitation near outbreak area - Bridger National Forest, Wyoming.





General Areas of Western Spruce Budworm Infestations--Bridger, Caribou, Targhee and Teton National Forests, 1972.

LEGEND

Infestation Intensity 1/	Symbol
Light	L
Medium	M
Heavy	H

1/ Determined by aerial reconnaissance.